

The effect of receptor like kinase mutations on wheat yield

Supervisory team:

Main supervisor: Dr Jill Harrison (University of Bristol)

Second supervisor: Prof Claire Grierson (University of Bristol)

Non-academic (CASE) supervisor: Dr Chris Burt (RAGT Seeds)

Collaborators: Emeritus Professor Keith Edwards (University of Bristol), Prof Christobal Uauy (John Innes Centre), Dr Scott Boden (University of Adelaide),

Host institution: University of Bristol

CASE partner: RAGT Seeds

Project description:

Summary: Ensuring continuous global food security will be a major challenge of the 21st century, and wheat contributes approximately 20% of the total calories consumed by humans (FAO, 2017). In wheat and other cereals, inflorescence (ear) size determines the number of flowers (florets) and grains produced, and grain filling is determined by productivity in the rest of the plant. These yield traits are regulated by the activity of stem cells in the growing shoot tips. Receptor-like kinase signalling maintains the size of the stem cell pool during plant development, and signalling mutants in crops such as maize and tomato have increased yields arising due to an increase in size of the stem cell pool. Using TILLING and CRISPR mutants, this project aims to analyse the effect of receptor-like kinase mutations on wheat yield traits.

The project will involve:

1. Crossing to remove off target mutations and Cas9 cassettes from mutant lines
2. Expression analyses of signalling pathway components
3. Lab and field analysis of mutant phenotypes

The project builds on prior work isolating wheat receptor-like kinase signalling components and mutants. The supervisory team will comprise Dr Jill Harrison, Professor Claire Grierson and Professor Keith Edwards at Bristol and Dr Chris Burt at RAGT seeds as CASE partner. This brings together Dr Harrison's expertise analysing receptor like kinase function with Professor Grierson's expertise in cell biology and gene regulatory networks and Professor Edwards' expertise with wheat. The CASE partnership with Dr Burt will enable direct translation of findings from lab experiments into the field and industrial breeding pipelines and will bring an opportunity for the student to directly experience knowledge exchange with wheat growers.

By combining computational and wet lab approaches, the project will provide training at the cutting edge of the plant development field. It will benefit from further formal teaching and internships included in the SWBioDTP programme. The skills and techniques the student will learn will be broadly applicable in the academic biology and biotech sectors and widely transferable amongst areas such as science policy, publishing and computing.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.